FIG. 1

Input
ATM Cell
(Communication Data)

600Mbps

Output
ATM Cell
(Communication Data)

600Mbps

Memory function of memory, etc. — 4

Processor
(Performing ATM cell processing) — 1

Instruction Memory — 3

Parameter
(Data RAM, etc.) — 2

Band width of 10 Gbps or over

FIG. 2

FIG. 3

10-1
Real time processing processor

14-1
Processing queue

11
Non-real time processing processor

Communication Data 1

- Parameter access
- Arithmetic processing

P1

Poling

Demand data absent

Communication Data 2

- Parameter access
- Arithmetic processing
- Process demand generation
- Queue write

P2

Poling

P7

Demand data absent

Communication Data 3

P6

- Parameter access
- Arithmetic processing

Parameter, Communication data, etc.

Poling

P3

Demand data present

Queue read **P8**

Parameter, Communication data, etc.

Communication Data 4

- Parameter access
- Arithmetic processing

P4

Processing start

- Parameter access
- Arithmetic processing **P9**

Communication Data 5

- Parameter access
- Arithmetic processing

P5

Poling

Processing end

P10

Demand data absent

FIG. 4

Communication Data 2   Communication Data 3   Communication Data 4

⟶ Time

Reception event of communication data

a

10-1 Processing of real time processing processor

b

Parameter access, acccess to communication data 1, and arihtmetic procassing	Write parameter and communication data 1 to queue

Parameter access, accccess to communication data 2, and arihtmetic processing

Parameter access

14-1 State of processing queue

c

0	1	0

11 Processing of non-real time processing processor

d

Polling state of queue   Polling state of queue

Queue read	Access to queue read data, parameter access, arithmetic processing

FIG. 5

→ Time

Communication Data 1   Communication Data 2   Communication Data 3

Reception event of communication data   a

Real time processing processor   b

Parameter access, arithmetic processing

Parameter access, arithmetic processing

Parameter access, arithmetic processing

Renew parameter (A)

Renew parameter (B)

Renew parameter(A)

Parameter (A)   c   A   X   Y

Parameter (B)   B   Z

Processing of the communication data 1 is demanded to the non-real time processing processor

Non-real time processing processor   d   Parameter access, arithmetic processing

Refer to parameter(A)

FIG. 6

Performance of A/T (Step/s)

Band width of 32/T (bit/s)

4-1

Memory function of memory, etc. (Storing reception ATM cell)

ATM cell

Parameter (The number of received user cells, BIP calculation value)

ATM cell (FPM cell)

10-1

Real time processing processor (Execution of intermediate plan processing)

Cash or register or local memory

Parameter (the number of received user cells, BIP calculation value)

Processing demand

Processing queue

14-1

11

Non-real time processing processor (Execution of statistical processing)

Performance of B/128T (step/s)

Band width of 0.75/T (bit/s)

Parameter (The number of discard cells, BIP calculation value)

2

Parameter (Data RAM etc.)

· The number of received user cells
· BIP calculation value

· The number of discarded cells
· The number of faultily delivered cells
· The number of error bits

FIG. 7

a Reception ATM cell

User cell	User cell	User cell	FPM cell	User cell	User cell	User cell

b Real time processing processor

| Intermediate measuring procesesing | Intermediate measuring procesesing | Intermediate measuring procesesing | Processing demand | Intermediate measuring procesesing | Intermediate measuring procesesing | Intermediate measuring procesesing |

Renewal Renewal Reset Renewal Renewal

c Parameter (The number of received cells)

| 10 | 11 | 0 | 0 | 1 | 2 |

d Parameter (BIP calculation value)

| A | B | 0 | 0 | C | D |

Transfer to queue

e Processing queue, storing information

| 11 | B |

f Non-real time processing processor

Statistical processing

Renewal Renewal Renewal

g Parameter (The number of discarded cells)

h Parameter (The number of faultily delivered cells)

i Parameter (Error bit number)

→ Time

FIG. 8A

ATM cell transmission side

N is minimum 128 by ITU-T provision

→ Time

User cell of N value

FPM cell | User cell | User cell | ... | User cell | User cell | FPM cell | User cell

The number of user cells
BIP calculation value

Reflect on payload
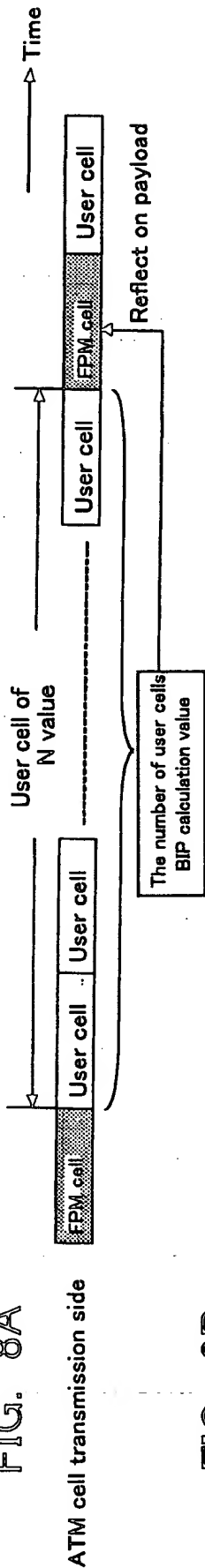
FIG. 8B

ATM cell reception side

FPM cell | User cell | User cell | ... | User cell | FPM cell

Calculate the number of received user cells and BIP calculation value

Comparison

- The number of discarded cells
- The number of faultily delivered cells
- Error bit number

FIG. 8C

ATM cell flow

FPM ID=0 | FPM ID=1 | User ID=0 | User ID=0 | User ID=0 | ... | FPM ID=0 | FPM ID=1 | User ID=1 | User ID=1 | User ID=1 | ... | FPM ID=1

Continuous reception of FPM cell of ID=0 and ID=1

When 128 user cells of same ID are not transmitted, the next FPM cell cannot be sent.

FIG. 9

4-1

Memory function of memory, etc.

(Storing reception ATM cell)

ATM cell

2

Parameter
(Data RAM etc.)

- The number of received user cells
- BIP calculation value
- The number of discarded cells
- The number of faultily delivered cells
- Error bit number

Band width of 128/T (bit/s)

Parameters
(The number of received user cells,
BIP calculation value,
the number of discarded cells,
the number of faultily delivered cells,
error bit number)

10-1

Processor
(Execution of intermediate measuring processing and statistical processing)

Cash or register or local memory

Performance of (A+B)T (step/s)

FIG. 10

Communication Data

Communication data reception completion signal (DMA demand)

4-1

Memory function of memory, etc. (Storing communication data)

Communication Data

20

DMA Control Circuit

Control Signal

Parameter

Communication Data

10-1

Real time processing processor

10-3

Cash or register or local memory

Processing demand

14-1

Processing Queue

11

Non-real time processing processor

Parameter (Data RAM, etc.)

2

FIG. 11

10-1
**Real time
processing processor**

14-1

11
**Non-real time
processing processor**

Processing queue

° Write pointer=0
° Read pointer=0

Communicaiton
Data 1

° DMA activation

I

Communicaiton
Data

° Parameter access

Pamameter

Poing

° Arithmetic processing

Communicaiton
Data 2

Processing demand
abesent

(Write pointer=
Read pointer)

II

° DMA activation

Communicaiton
Data

° Parameter access

Pamameter

° Arithmetic processing

° Processing demand
generaion

III

Processing
demand

° Increase write
pointer

Poing

° Processing demand
present

(Write pointer≠
Read pointer)
Queue read
(Parameter, communication data)

IV

° Increase write
pointer

Processing start
° Parameter access
° Arithmetic
processing

FIG. 12

START

↓

P20
Communication data reception ? — No →

Yes ↓

Transfer parameter to real time processing processor   P23

DMA activation   P21

↓

Arithmetic processing by real time processing processor   P24

Communication data transfer to queue (Parameter transfer)   P22

↓

P25
Processing demnad present ? — No →

Yes ↓   ↓

Valid transfer data to queue (Increse queue write pointer)   P26

Invalid transfer data to queue (Not renew value of queue write pointer)   P27

↓

END

FIG. 13A

Reception event of communication data

Processing of real time processing processor

Communication data 1

Parameter access, access to communication data 1, arithmetic processing

Write parameter and communication data 1 to queue

T time

Communication Data 2

Parameter access, access to communication data 2, arithmetic processing

Surplus time until processing of next communication data is started executing

→ Time

FIG. 13B

Reception event of communication data

Processing of real time processing processor

DMA transfer control

Communication Data 1

Parameter access, access to communication data 1, arithmetic processing

Write parameter and communication data 1 to queue

T time

Increase write pointer of queue

Communication Data 2

Parameter access, access to communication data 2, arithmetic processing

Write parameter and communication data 2 to queue

→ Time

FIG. 14

DMA control circuit 20

Communication data reception completion signal (DMA demand)

Control signal

Parameter

Communication Data

Processing queue 14-1

Non-real time processing processor 11

Memory function of memory, etc. (Storing communication data) 4-1

Merge

21 Processing demand

Processing demand 110-3

Processing demand 110-5

Processing demand 110-6

Processing demand 110-2

Processing demand 110-4

Real time processing processor 100-3

Real time processing processor 100-2

Processing demand 110-1

Real time processing processor 100-1

Parameter (Data RAM etc.) 2

Communication Data

FIG. 15

→ Time

a Received communication data

| Communication Data (A) | Communication Data (B) | Communication Data (C) | Communication Data (D) |

b Processing demand 1 generated by real time processing processor 1

| Processing demand 1 (A) | Processing demand 1 (B) | Processing demand 1 (C) | Processing demand 1 (D) |

c Forwarding or processing demand

| Processing demand 1 (A) | Processing demand 1 (B) | Processing demand 1 (C) |

d Processing demand 2 generated by real time processing processor 2

| Processing demand 2 (A) | Processing demand 2 (B) | Processing demand 2 (C) |

e Forwarding or processing demand

| Processing demand 1 (A) | Processing demand 1 (B) | Processing demand 1 (C) |
| Processing demand 2 (A) | Processing demand 2 (B) | Processing demand 2 (C) |

f Processing demand 3 generated by real time processing processor 3

| Processing demand 3 (A) | Processing demand 3 (B) | Processing demand 3 (C) |

g Processing demand to non-real time processing processor

Processing demand 1 (A)	Processing demand 1 (B)	Processing demand 1 (C)
Processing demand 2 (A)	Processing demand 2 (B)	Processing demand 2 (C)
Processing demand 3 (A)	Processing demand 3 (B)	Processing demand 3 (C)

FIG. 16

Processing demand to non-real time processing processor
(In use for judgment of validity/invalidity of transfer data)
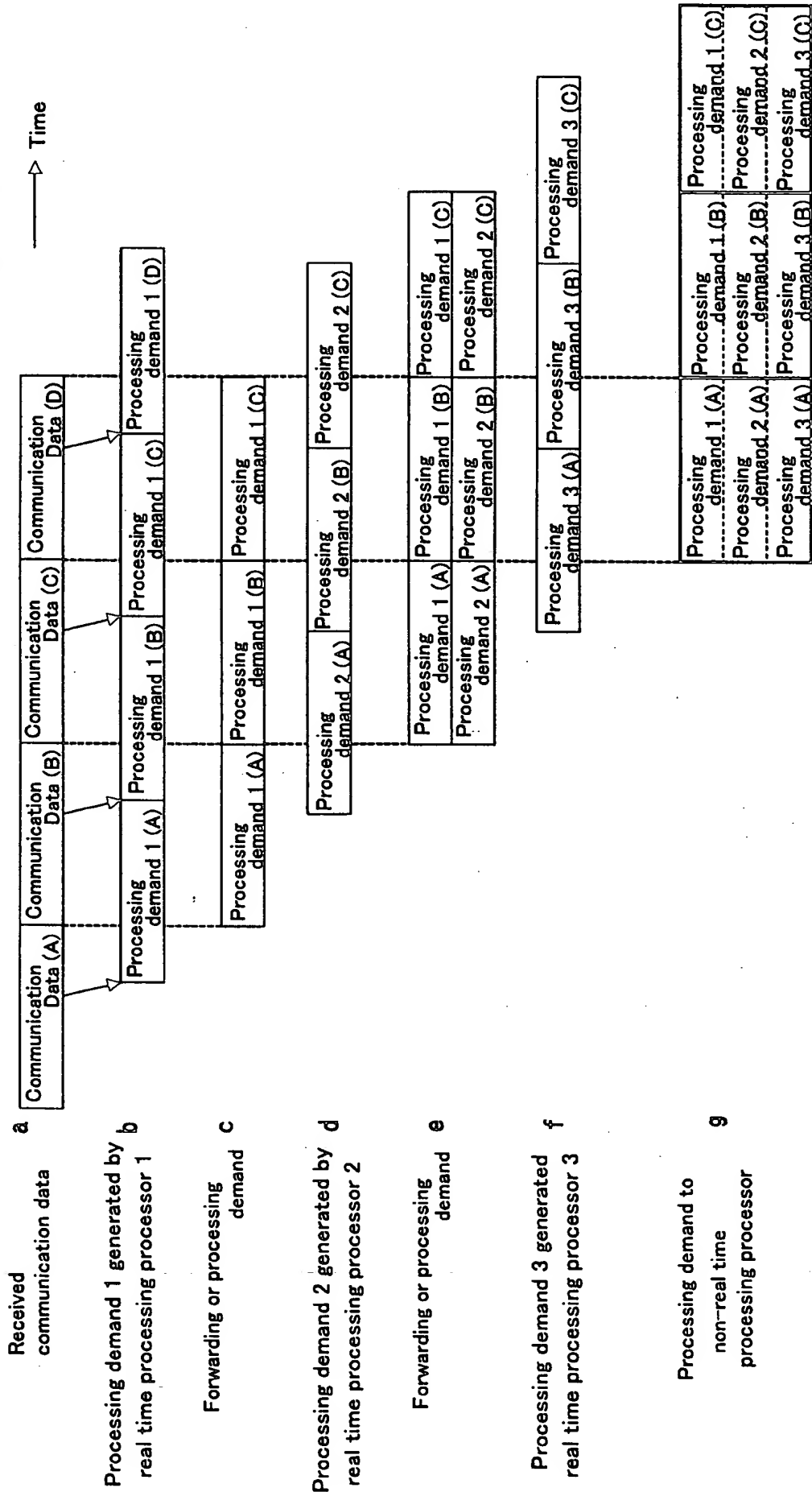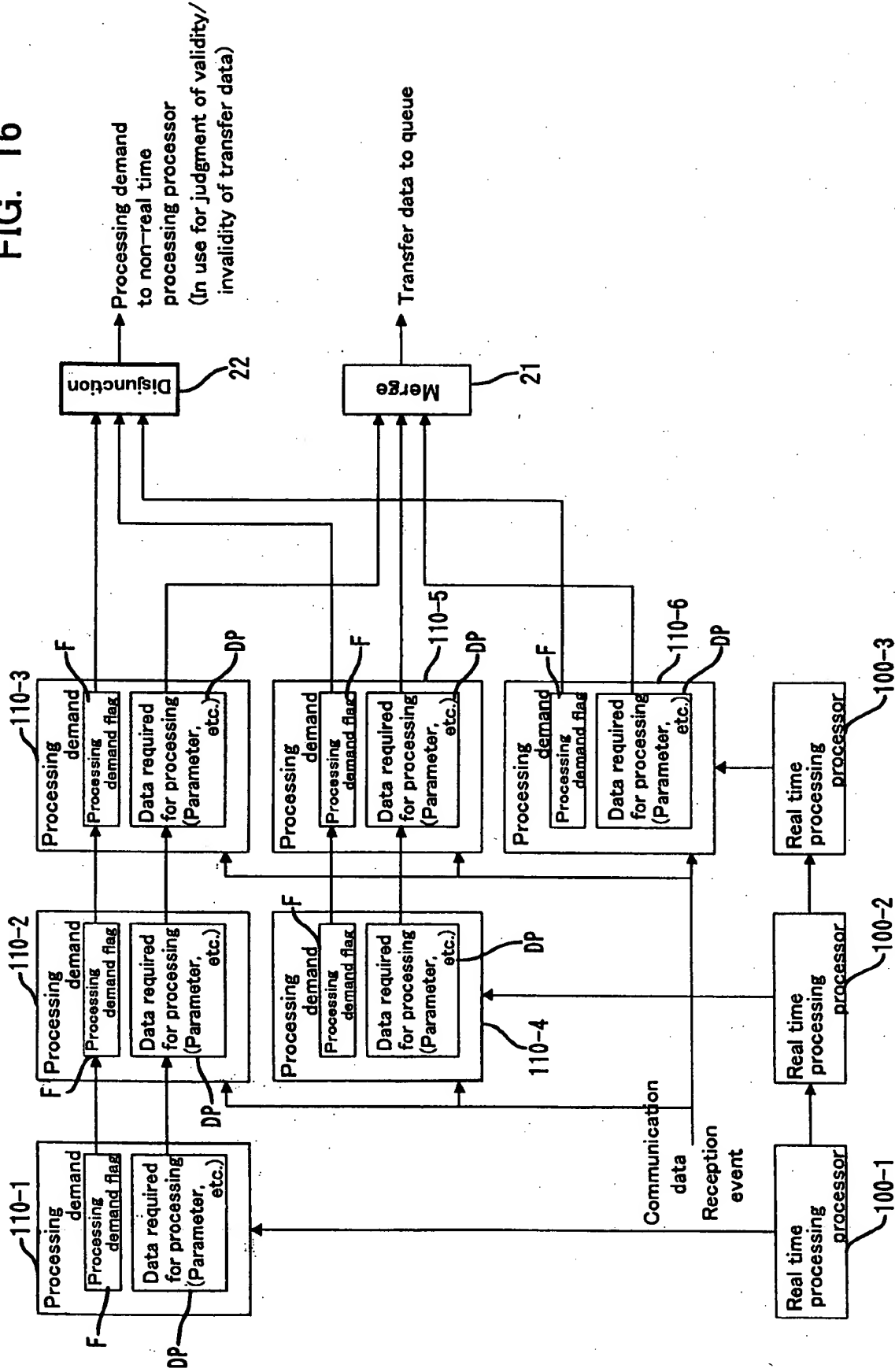
Transfer data to queue

FIG. 17

11
Non-real time
processing processor

15-1
Processing queue

10-1
Real time
processing processor

Communicaiton
Data 1

∘Processing start

Read

∘Demand results of
non-real time processing

Read disable
(no data)

Write processing result
I

∘Processing completion

Communicaiton
Data 2

∘Processing start

Read

∘Demand results of
non-real time processing

Read OK
(data existent)

II

∘Communication data
overwrite
∘Processing completion

Communicaiton
Data 3

∘Processing start

Read

∘Demand results of
non-real time processing

Read

FIG. 18

Non-real time processing processor   a

Arithmetic processing by processor	Write processing results to queue

State of queue   b

0	1	0

Communication data processing event   c

Communication Data 1   Communication Data 2   Communication Data 3   Communication Data 4   Communication Data 5

Real time processing processor   d

Processing of communication data 1	Processing of communication data 2	Processing of communication data 3	Processing of communication data 4

Processing results of non-real time processing processor have not yet been stored in queue.

As processing results of non-real time processing processor have been stored in queue, the processing results can be used by real time processing processor.

→ Time

FIG. 19